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E REGULATION OF PUBLIC UTILITIES BY COMPETITION IN THE SECURITIES MARKET.
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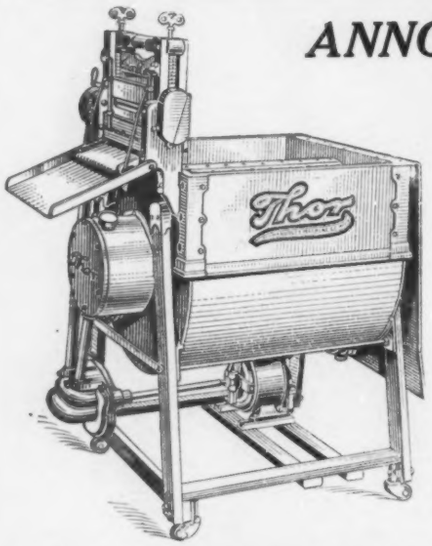

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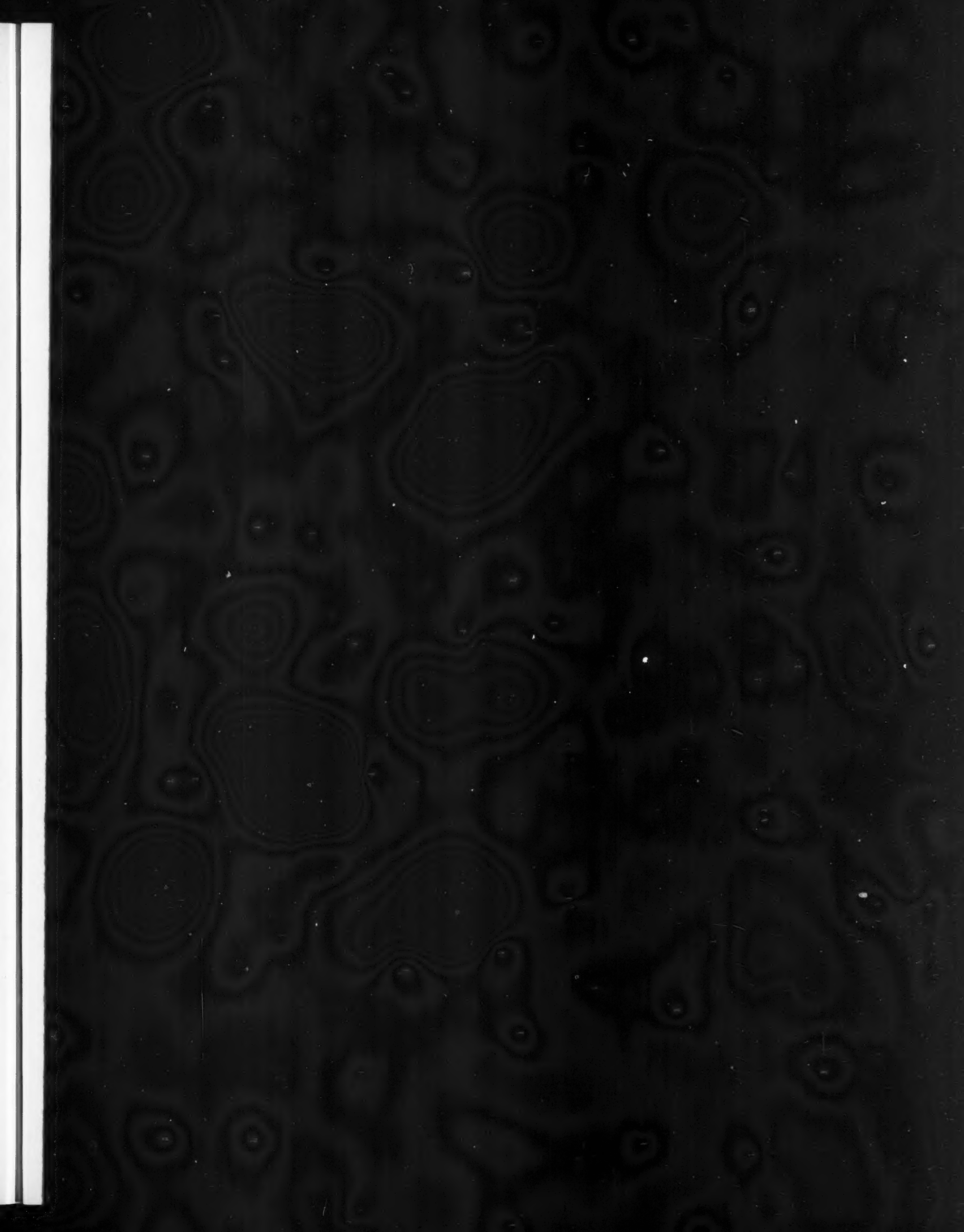

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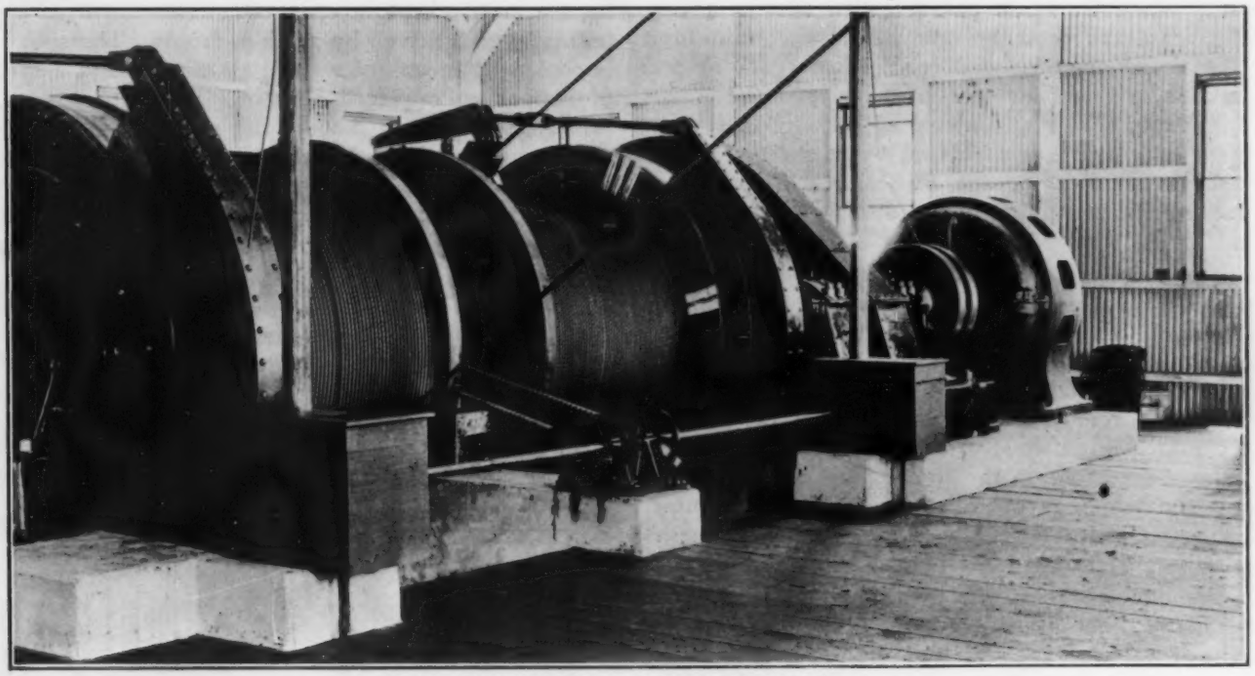
ELECTRIFICATION OF THE EMPIRE MINE

BY R. A. BALZARI.

(Interesting details are here given regarding the application of electric drive to a 500 h.p. mine hoist and a 60-stamp mill. Noteworthy features of the hoist installation include herringbone gears, liquid rheostat control and electrical safety devices. The author is sales engineer with the San Francisco office of the Westinghouse Electric & Manufacturing Company.—The Editor.)

Recent practice in mine and mill electrification is typified by the installation at the Empire mine, Grass Valley, Cal., completed in June of this year. As this famous old producer has gone to greater depths and as the output has continued to increase, it became necessary to install a new and larger hoist and to redesign the mill. Electric operation has proven so universally successful that Mr. Geo. W. Starr, the manager of the mine, decided to utilize its aid for his properties, and as a result the Westinghouse Electric & Manufacturing Company received the contract to install a 500 h.p. electric hoist and to equip the mill with motor drive.



New 500 h.p. Electric Hoist at Empire Mine.

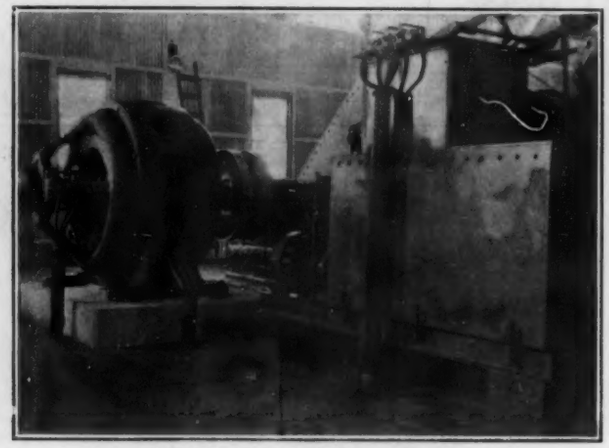
The hoist is of the double-drum type manufactured by Wellman-Seaver-Morgan Co. and embodies several features which are unique in California mine practice. The most important innovation is that the hoist drums are geared by a single-reduction herringbone gear to a high-speed phase-wound induction motor, having a gear ratio of 14 to 100, the motor being run at a full load speed of 435 r.p.m. With two layers of rope on the drum, this gives a hoisting speed of 1200 ft. per minute in the shaft when all resistance is cut out of the controller.

The hoist drums are 6 ft. in diameter, and have a capacity of 8000 ft. of rope per drum. This is intended to handle 4 tons of ore at a rate of 1200 ft. per minute from a depth of 7500 ft. The gears have a 14-in. face, and are enclosed in a sheet iron case, which is lagged to deaden the sound of the gears. This installation runs so quietly that the gears cannot be heard from the opposite end of the hoist room. By

employing this type of high-efficiency gear connection it is possible to greatly increase the efficiency and economy of electric hoisting, especially as the poor load factor of a low-speed motor direct connected to the drum of the hoist is thereby avoided.

The hoist mechanism is controlled from the main operating platform, all brakes being controlled by air. The air for operating the valves is obtained directly from the main compressor line that furnishes the air for the mine. There is, however, installed in conection with this a small motor-driven compressor of 40 ft. capacity, which works in parallel with the main line, and in case the pressure falls below a certain limit in the reservoir, this small compressor cuts in and maintains sufficient air pressure to operate the brakes at all times. The advantage of having this compressor on the line is such that when the main compressor is shut down, due to repair work or other causes, the hoist equipment can still be kept in operation.

Main Operating Platform, Showing Air Valve Control.



Liquid Rheostat Motor Control.

The hoist motor is the Westinghouse type CW. 500 h.p., 3 phase, 60 cycles, 1140 volts, 435 r.p.m. at full load. This motor is connected to the pinion of the hoist through wire link flexible couplings. The motor has been designed so that plugging or braking by the motor is possible. In other words, in case the operator is desirous of stopping the skips by reversing the current in the motor, this will not overstrain the windings or cause any electrical trouble. This particular feature is one of the later developments in alternating current hoist motors.

The motor is controlled by a liquid rheostat. The resistance in the motor secondary is regulated by the height of water on the plates on the upper tank of the rheostat, the height of this water being governed by a gate valve in this tank. This gate valve is operated by a lever from the operator's platform, and eventually will be motor-operated and all mechanical connections will be removed between it and the operating platform. This will simplify to a large extent the general operation of this part of the equipment, and cut down the number of levers on the operator's stand.

The liquid controller is so adjusted that the operator can hoist men or an empty skip from any point in the mine at a speed not to exceed 500 ft. per minute. This speed was greatly reduced on test, it being demonstrated that the control equipment would allow a reduction of speed so that a skip containing one man could be raised from the bottom of the mine to within 200 ft. of the collar of the shaft slowly enough to allow an inspection of the shaft. This would mean that the skip was running not to exceed 300 ft. per minute. This ability to get close speed regulation on the equipment means that the operators have absolute control of the hoist at all times, enabling them to operate at any speed and in any manner which they desire.

The electrolyte is a weak solution of sodium carbonate and is kept in constant circulation by a centrifugal pump driven by a 2 h.p. motor. The solution is cooled by means of water passing through a series of copper coils placed therein. The advantages of this type of control include the wide range of speed which can be obtained under low load conditions, the economy of space as compared with the grid type of resistance, the low cost of upkeep, the insurance against fire due to shorts in the secondary resistance,

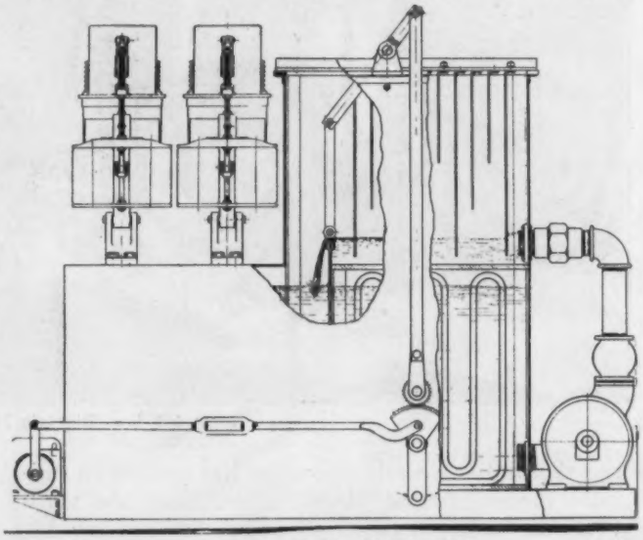
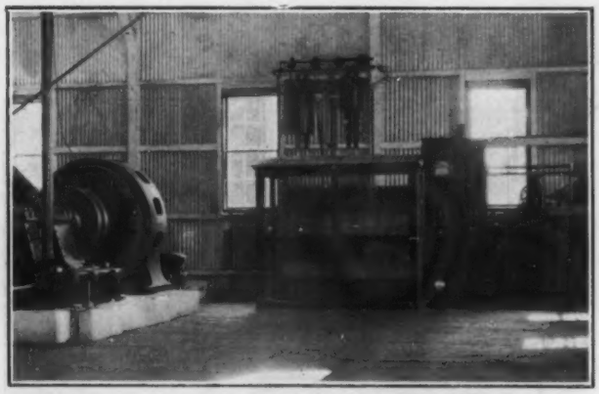


Diagram of Liquid Rheostat.

and the ease with which it handles the load, there being no jerks or sudden strains put upon the equipment between the time of starting and the full speed of the motor. This in indicated by the accompanying copy of graphic chart record.

The primary panel and main control panels of this equipment are shown in the accompanying illus-

tration. The main primary panels consist of type F Westinghouse magnet switches. In connection with this, all leads to the motor are open when the motor is dead, thereby saving the chance of injury to any

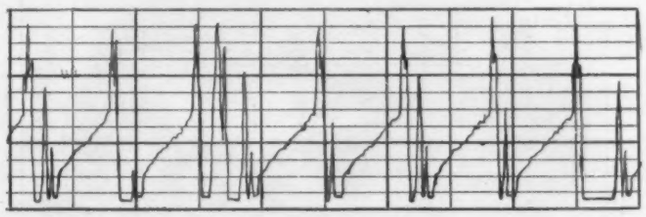


Primary Panel and Main Control Panels, Also Showing Cover Removed from Limit Switch at Left of Picture.

operator who might come in contact with any leg on the motor side.

Panel No. 2 contains the main circuit breaker for handling this installation, and has also a polyphase integrating wattmeter, which shows the total amount of power consumed by the hoist during the period of operation. On this same panel is shown a polyphase graphic recording wattmeter, which gives a check on the character of operation of each man on the hoist. In other words, if the man is not handling his hoisting equipment properly, or is wasting time, it is quickly and easily seen on the graphic chart.

The next panel is a regulator panel, and contains the switches governing the regulator, which is on the extreme right of the switchboard. The switches are so arranged that the regulator may be cut out



Graphic Chart.

at any time and the power line cut straight through to the hoist equipment. This regulator was installed to maintain a constant voltage at the hoist house, and thereby eliminate any voltage trouble from this part of the equipment. The regulator maintains 1140 volts at the hoist, within a fluctuation of 5 volts in either direction. A closer range of voltage could be obtained, but it would not be necessary on this type of installation.

There is also a small panel mounted on the operating platform and carrying a voltmeter, ammeter and air gauge. The voltmeter and ammeter indicate to the hoist engineer the operating conditions on his hoist. The air gauge shows the pressure in his air line. The 3-pole knife switch on this panel controls the 2 h.p. motor driving the circulating pump on the liquid rheostat.

Although the mine at the present time is only at a depth of 5500 ft., the hoisting equipment has been installed to handle to a depth of 7500 ft. Working at a depth of 7500 ft., this hoist equipment will handle an equivalent of 25 tons per hour, the maximum output per shift being approximately 150 tons, these shifts consisting of three 8-hour periods and the hoist working over approximately 6 hours at each of these periods. It is estimated that 45 seconds will be required in loading and approximately 10 seconds in dumping out of the time of each trip. The load in each case will be made up as follows: The weight of skip about 3300 lb., weight of ore about 8000 lb., and to this must be added the weight of a 1-in. rope, which is utilized in this installation, the weight of rope being dependent upon the depth from which they are hoisting at the time. The shaft is laid out on 30 deg. incline.

In connection with the hoisting equipment, several safety devices have been utilized. The first safety equipment installed was a geared limit switch. This switch is operated by bevel gear drive from the shaft, which operates the indicator. This switch is set so that the hoist engineer must have his hoist under control when the skip reaches a point 200 ft. from the collar of the shaft. If he does not have the equipment under control, the switch trips the circuit breaker on the motor equipment, and automatically sets the air brakes, bringing the skip to rest by the time it reaches the collar of the shaft. The operation of the limit switch can be prevented if the operator has control of his hoist, and holds down a push button while the skip is passing this point. If he does not press this button and in this manner indicate that he has the motor under control, the limit switch will open the circuit breaker and set the air brakes. It is then necessary for him to walk from the operating platform to the switchboard, press a button, which releases the brake magnets, and throw in the circuit breaker before he can again start the hoist. This inconvenient method is utilized for two reasons; first, to keep the operator's mind on his work, and, second, to keep him from allowing the safety device to work every time the skip passes this point. In other words, we do not care to use the safety device for any other reason than safety.

An additional equipment has been installed to prevent the operator from allowing his skip to come into the dump at too high speed, thereby tending to rack the head frame. This is similar in operation to the one indicated above. At the entrance to the dump a push button is placed so as to be actuated by the flange on the front wheel of the skip. This push button makes a contact which rings a bell and lights a bank of lights. The instant the front truck passes this point of contact, the bell stops ringing and the lights go out. As the skip is brought up to the dump position, that is, the position where all of the ore will discharge, a second contact is made, which again lights the lights. There is also at the upper end of this travel a spring bumper, which works in conjunction

with an air valve. This bumper allows a travel of approximately 18 in. If the operator is careful when bringing the skip into the dump, the spring is only compressed about 4 or 5 in. If, however, he hits the dump at too high a speed, it forces the bumper back

Automatic Device to Prevent Over Winding.

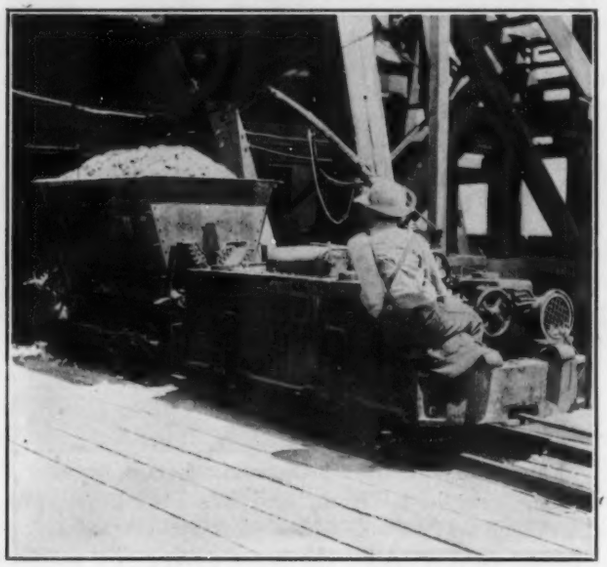
the full 18 in., releases an air valve which in turn sets the brakes on the hoist and opens the circuit breaker on the main switchboard. This causes him to go to the main switch panel, close the breaker, press the button which releases the operating mechanism, and then return to his platform to again start his hoist. As noted above, the reason for this is to cause the operator to utilize this portion of the device only as a safety measure, and not under general operating conditions. Recently this safety device was tried out accidentally. An operator left open the waste rock chute when he was hoisting ore to the upper dump. The hoist engineer, not knowing that this lower dump was open, allowed the skip to come into it at quite high speed. As the skip went into the dump and came up against the bumper with considerable force, the bumper was driven back the full distance, and the brakes were immediately set on the hoisting equipment, the electrical apparatus was cut out of action, and no damage was done to the head frame. If, however, this safety equipment had not been installed, in all probability the skip would have torn away part of the head frame before the operator could have stopped the hoist by his own efforts. Inasmuch as the human element cannot be entirely depended upon in the operation of a hoist equipment, the addition of these safety devices allows for the times when the operator is liable to day dream and think that his skip is at one of the lower levels when it is approaching the collar of the shaft or cause trouble by pulling a skip into the dump at too high speed.

The device is illustrated herewith so as to show the skip in dump position. The air and spring cylinder is shown at the top, and the contact maker for lighting the light in the center of the picture, just to the right of the skip.

The ore is moved from the ore chute to the mill by a 3½ ton Westinghouse Baldwin locomotive. It handles six 3½ ton cars.

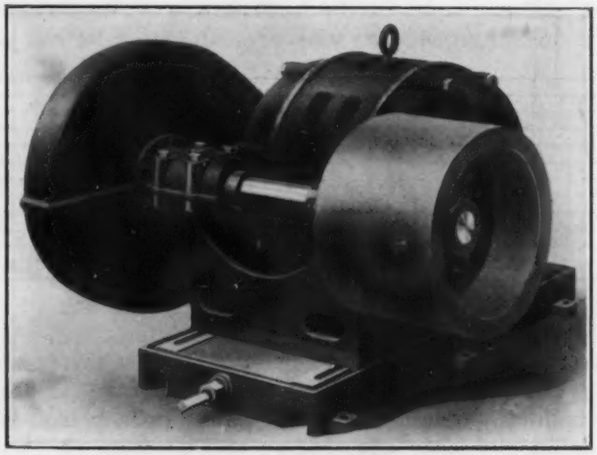
Mill Installation.

Another innovation in California mining is the 60-stamp mill equipment, divided into six batteries of 10 stamps each, each battery being driven by direct drive from the motor to the bull wheel, which is



Locomotive for Taking Ore to Mill.

mounted on the cam shaft which operates the stamps. The motor drive in this case is a Westinghouse special back-geared motor, the motor being 35 h.p., 3 phase, 60 cycles, 440 volts, 850 r.p.m., with a gear reduction of 5¾ to 1. The motor is belted to the main bull wheel, which gives 98 drops per minute per stamp.



Back-Geared Mill Motor.

The stamps are considerably heavier than those ordinarily used, being 1360 lb. each, and each stamp handling 5 tons of ore per day. The actual power consumed on a battery of ten stamps of this capacity is 31½ h.p. The motors are set back from the mill on separate concrete foundations, in order to eliminate as much as possible the vibration due to the stamps' operating. The motors are of squirrel cage construction, and are operated by auto starters, equipped with low voltage and overload release coils. This type of

motor drive has several advantages over the old method of driving an entire mill of 20 or 40 stamps by a single motor. One of the most obvious of these is the fact that any 10 stamps can be hung up during a clean-up, and thereby save the chance of an operator losing a finger, due to the stamp being improperly jacked up. Also, in starting up, it is not necessary to lift the stamp off the die, but the entire 10 stamps can be started by the motor without any trouble. Therefore, when anything arises whereby the operator needs to make adjustments or any changes in any particular battery, this battery can be shut down and the work done without any chance of the operator becoming injured. Another advantage of this type of drive is the fact that it eliminates all overhead line shafting and the additional belt, pulleys and boxing necessary for operating this additional line shaft. It can be seen at once that this is a considerable power saving, and would, in itself, warrant the installation of this character of drive.

The first thing that a miner in making an installation desires, is to get an installation which is mechanically right. This, in former times, was the all-important feature, and nothing else seemed to matter. In the later installations, however, they are taking into account the matter of efficiency, and it is easily shown that different characters of drive, whereby one or two per cent efficiency can be obtained, will warrant their installation. For instance, the saving of 1 per cent in a stamp mill drive would mean a saving in a year's operation of this particular mill, of approximately $120. It is estimated that a saving of approximately 5 per cent was made when the mill was changed to this character of drive.

EFFECTIVE RESISTANCE AND INDUCTANCE OF IRON AND BIMETALLIC WIRE.

When a direct current flows in a wire, the distribution of the current is uniform over the cross-section of the conductor. When, however, an alternating current flows in a wire there is a tendency for the current to crowd to the outside. This phenomenon which is caused by differences in the opposition to the current flow in different parts of the conductor, becomes more pronounced the greater the number of alternations of the current in a given time and, in iron wires, the greater the current in the wire. In some cases the flow of current is confined almost entirely to a thin shell on the outside of the wire and hence arises the term "skin effect" for this phenomenon. The effective resistance of the conductor increases as the frequency of the alternations increases and at the same time the inductance, which depends upon the magnetic field, is diminished. This effect is not only of interest from a purely scientific standpoint, but is frequently of importance in engineering practice.

When the conductor is of simple form and the magnetic permeability of the material is known, the effective resistance and inductance can be calculated by formulas which have been developed. The investigation, the results of which have just been published by the Bureau of Standards, Department of Commerce, in Scientific Paper No. 252, was concerned with the skin effect in conductors containing iron.

THE CONTROL OF WATER POWERS.

BY LEONARD LUNDGREN.

(Evidence is here presented to prove that co-operaticve control over public lands and public waters can be exercised between the States and the Nation. The author is district engineer for the U. S. Forest Service at Portland, Ore.—The Editor.)

Much has been said and written along theoretical lines about the dual control of water powers in the United States between the Federal Government and the sovereign states, one arising from the ownership of public lands and the other from state laws on the appropriation of water. Many writers have attempted to point out that such control is incompatible with the industrial development of the country, and actually hinders its growth. In actual practice, however, the Federal Government works in closest harmony with the state. The regulations of the Secretary of Agriculture, effective February 1, 1915, contain the following:

"Wherever the approval of a state administrative official, board or commission is a condition precedent to the right either to take and use water for power purposes or to engage in the business of the generation, transmission or distribution of power, certified evidence of such approval must be filed * * * before a final permit will be issued. Formal notification by such official, board or commission that the water right has been canceled or that the permission to engage in the power business withdrawn, will be deemed sufficient grounds for the revocation of the permit."

This or a similar requirement has been in force in the regulations of the Departments of the Interior and Agriculture for the last five years. During this period no person has secured a permit to construct a water power plant on public lands without first securing a water right from the state. Recently, in order to facilitate the approval of applications for water power both by the State and the Federal Government, the following co-operative agreement was entered into between the State Water Commission of California and the Secretary of Agriculture:

Co-operative Agreement—Water Power.

For the purpose of facilitating the approval of applications for water rights and for the occupancy and use of National Forest lands within the state of California for the development of water power, and in order that uniform action may be taken with respect to such applications, the secretary for the United States Department of Agriculture and the Water Commission of the State of California, subscribe to the following co-operative agreement:

1. Whenever an application for either a preliminary or a final permit for a water power site is filed with the District Forester at San Francisco, California, and the evidence of the appropriation of water consists of a notice posted in conformity with the provisions of Section 1415 of the Civil Code of California, immediate notice of such application for a permit, consisting of the name of the applicant, the name of the stream from which the water is to be diverted, the point of the proposed diversion, the date of the notice, and the name of the locator, shall be sent to the State Water Commission.

2. Whenever such application for a permit is filed with the District Forester, and the evidence of the appropriation of water consists of an application made to the State Water Commission under the existing Water Power Act, it will be sufficient to inform the commission that such application for permit has been filed with the District Forester,

3. Whenever an application is made to the State Water Commission for a permit to appropriate water, and the use of such water will in any manner necessitate the occupancy and use of any National Forest land, immediate notice of the filing of such application shall be given to the District Forester at San Francisco. Such notice shall give the name of the applicant, the stream from which the diversion is to be made, the point of the proposed diversion, the date of the notice, the name of the locator, and a description of the lands that may be within such National Forest.

4. No application for a water right involving the use of Natonal Forest lands will be approved by the State Water Commission prior to notification by the District Forester that a complete application for the use of the National Forest lands has been filed in conformity with the regulations of the Secretary of Agriculture.

5. If the application filed with the District Forester, as provided in paragraph 4 hereof, is for a preliminary permit, the State Water Commission will defer final approval of any application for water right until notified by the District Forester that a complete final application has been filed in accordance with the regulations of the Secretary of Agriculture, or that a preliminary permit containing permission to do construction work has been issued.

The District Forester will confer with the State Water Commission before arranging the terms of any preliminary permit and will furnish the commission with copies of such permits immediately upon their issuance.

6. If the evidence of the appropriation of water filed with an application for a final permit for a water power site consists of a notice posted in conformity with the provisions of Section 1415 of the Civil Code of California, such permit will not be issued until the State Water Commission either approves such appropriations or disclaims jurisdiction. If the applicant relies upon an appropriation under the existing law, no final permit will be issued until notice of the approval of the commission has been filed with the District Forester.

7. No preliminary permit will allow construction upon National Forest land except in an emergency or to comply with the state law, and then only upon approval of the State Water Commission.

8. If the time for beginning and completing construction under any final permit issued by the Secretary of Agriculture is different from that granted by the State Water Commission, such difference shall not be deemed to affect in any way the permittee's liability under the state law or the approval of the commission, or to free him from the cancellation of his permit if he loses his water right under the state law.

9. If any permittee shall lose his water right because of failure to begin construction in accordance with the requirements of the state law and of the approval of the State Water Commission, such loss of right when certified to by the said commission shall be deemed sufficient cause for revocation of the permit.

10. If either the District Forester or the State Water Commission shall fail to give notification of any action as contemplated herein, within sixty (60) days of the receipt of written report of applications pending, the officer or office so reporting may take action without waiting further for such notification.

In witness whereof, this co-operative agreement has been executed at San Francisco, California, by the State Water Commission of California, on the 27th day of August, 1914.

(Signed) CHAS. D. MARX,
HAROLD S. POWER,
S. C. GRAHAM.

And at Washington, D. C., by the Secretary of the Department of Agriculture, on the 14th day of November, 1914.

D. F. HOUSTON, Secretary of Agriculture.

The effectiveness of an agreement of this kind is well illustrated in the following letter written to the company by the Secretary of Agriculture:

March 26, 1915.

Sir:—The Forester, having sustained the action of the District Forester at San Francisco denying the application of the company for certain rights of way within the Inyo National Forest, has transmitted to me the record in the case, including the petition and brief on appeal, enclosed with your letter of January 21, 1915, addressed to the District Forester at San Francisco, and the minutes of the hearing held before the State Water Commission of California, 1914, "In the matter of the application of the company for use of certain waters on the South Fork and North Fork Creek, etc." The Solicitor of the Department has also delivered to me a letter, together with copy of the petition, brief and argument, received by him from your counsel. All of these have received careful consideration.

It appears that the company filed in the office of the District Forester at San Francisco, on October 14, 1914, an application for rights of way for dams, reservoirs, water conduits, power houses and transmission lines, comprehending a development of five power projects on creek in the Inyo National Forest, California. The application so presented was complete with the exception of a permit from the State Water Commission for the use of water as required by paragraph (H) of Regulation L-11, of the Regulations of the Secretary of Agriculture relating to water power in the National Forests, adopted February 24, 1913.

It appears also that the power company made application to the State Water Commission of California for approval of its appropriation of waters from the North and South Forks of creek for the purposes of the proposed power development, but that such application was rejected by the commission in 1914, "because they believed that the public interest so demanded."

On account of the incompleteness of the application as required by the aforesaid regulation of this Department, the District Forester, on November 28, 1914, held the company's application for rejection and allowed it sixty days within which to appeal, if it so desired. This appeal has been taken and the company asks that its application be reinstated for action upon its merits, on the ground that the provisions of Regulations L-10-(G) and L-11-(H), of the aforesaid regulations, should not be construed as applying to the National Forests, because the administration and control of waters of non-navigable streams within National Forests, for hydroelectric power development, rests solely in the government of the United States, and the state of California cannot, without the consent of congress, "enact any valid law regulating the appropriation of the waters of National Forests for power purposes." The petition, brief and argument submitted in support of the appeal are likewise based, exclusively, upon this issue.

Regulations L-10-(G) and L-11-(H) were adopted by this department upon administrative considerations only, and chiefly in order that the Department and the states might co-operate, as far as practicable, in the administration of water development in the National Forests within the respective states. The regulations were adopted with full appreciation of the legal questions which are involved in the appropriation and use of waters on the reserved lands of the United States and without any purpose, express or implied, to relinquish any rights which the United States may have in and to the waters in the National Forests. It is believed that better results can be secured under existing conditions by co-operative action between the state and federal authorities than by any insistance upon strict legal rights on behalf of either.

Since Regulations L-10-(G) and L-11-(H) have been adopted for administrative reasons, and cannot be held to express, in any degree, the views of this Department with respect to the legal rights of the United States in the unappropriated waters of navigable streams in National Forests, or to be a waiver of any rights therein that the United States may possess, no reason is perceived why the Department should, in this case, waive or modify the requirements of these regulations.

The action of the Forester in rejecting the application of the ..... Company is sustained.

Very respectfully,

D. F. HOUSTON, Secretary.

This letter can leave no doubt of its intent in the mind of the reader. It shows that the United States is not assuming the exercise of any function of the sovereign state. Whatever right of control over water power sites the Federal Goverment may have through ownership of public lands, the administration of such sites is being used to supplement the efforts of the state to conserve its natural resources.

A co-operative agreement has also been entered into with the state of Oregon, which still further illustrates this principle. This document is copied below, as it states fully the salient points of the purposes to be accomplished:

Co-Operative Agreement—Water Power—Between the Secretary of the United States Department of Agriculture and the State Engineer of the State of Oregon.

In order to insure co-operation and uniform action, to avoid duplication of work and expense, to make available to both the data secured and the action taken by each, and to facilitate the approval of applications for wrater rights for the occupancy and use of National Forest Lands within the state of Oregon for the development of water power; the Secretary of the United States Department of Agriculture and the State Engineer of the state of Oregon do make and subscribe to the following co-operative statement:

1. Whenever an application for permit for a water power site is filed with the District Forester at Portland, Oregon, notice will be sent the State Engineer, together with a copy of the evidence of the appropriation of water, unless said evidence has been furnished the Forest Service as hereinafter provided.

2. Whenever an application is made to the State Engineer for a permit to appropriate water for power purposes and the use of such water will in any manner necessitate the occupancy and use of any National Forest land, a copy of such application will be immediately sent to the District Forester at Portland.

3. The District Forester will confer with the State Engineer before arranging the terms of any preliminary permit, and will furnish him with a copy of such permit immediately upon its issuance.

4. No application for a water right, which will involve the use of National Forest lands for reservoir, conduit or power house purposes, will be passed upon by the State Engineer prior to the receipt of a copy of a final permit, or of a preliminary permit containing permission to do constructon work, or of a notice that the application for a power permit has been rejected by the Secretary of Agriculture. The State Engineer will be given immediate notice of the above stated action.

5. If the evidence of the appropriation of water filed with an application for permit for a water power site shows the water right to have been initiated prior to February 24, 1909, such permit will not be issued until the State Engineer either approves such appropriation or disclaims jurisdiction.

6. If the time for beginning and completing construction under any final permit issued by the Secretary of Agriculture is different from that granted by the State Engineer, such difference shall not be deemed to affect in any way the permittee's liabilities either under the state law and approval of the State Engineer or under the permit issued by the Secretary of Agriculture.

7. If any permittee shall lose his water right because of failure to begin or complete construction in accordance with the requirements of the state law and of the approval of the State Engineer, such loss of right when certified to by the State Engineer shall be deemed cause for revocation of permit by the Secretary of Agriculture.

8. Neither the District Forester nor the State Engineer will take action on any petition for an extension of time until due notice of the filing of such petition and opportunity for recommending action has been given. Each will immediately furnish the other with copy of any extension of time that may be granted.

9. The State Engineer will furnish the District Forester with a copy of all water power permits, of all notices of beginning of construction, of prosecution of work with diligence, of completion of construction, and of the complete application of water and of all final water right certificates in water power cases affecting National Forest land.

10. The District Forester will furnish the State Engineer with copies of the semi-annual construction and operation reports on power cases in the state of Oregon, with sets of blue prints of maps and plans of such power projects after completion of construction, except such as may have been filed as confidential information, and with proclamation diagrams of the National Forests in Oregon as such are issued.

11. If either the District Forester or the State Engineer shall fail to give notification of any action as contemplated herein, within sixty (60) days of the receipt of written report of applications pending, the officer or office so reporting may take action without waiting further for such notification.

12. It is understood that the execution of this agreement shall not affect, and is not intended to affect, in any degree, the legal rights either of the United States or of the state of Oregon with respect to the ownership or control of the public lands or waters within the state of Oregon.

13. This agreement shall be indeterminate in duration but may be terminated by either party hereto upon due notice to the other.

In witness whereof, This Co-operative Agreement has been executed at Salem, Oregon, by the State Engineer of Oregon on the 13th day of May, 1915.

JOHN H. LEWIS,
State Engineer of Oregon.

And at Washington, D. C., by the Secretary of the Department of Agriculture, on the 21st day of May, 1913.

CARL VROOMAN,
Acting Secretary of Agriculture.

It is to be anticipated that other states having laws which permit co-operation, as outlined above, will see the advantages that will accrue to all parties concerned and will, accordingly, enter into similar agreements.

It has been the aim of this article to give documentary evidence of the fact that co-operative control over public lands and public waters can be and is being exercised in complete harmony by the state and national goverments, to their mutual advantage and without the surrender of any rights which either may possess.

INVESTIGATION OF MUNICIPAL DISTRIBUTION AT MEDFORD.

(The report of L. E. Hinman, electrical inspector at Medford, to the authorities at Medford, Oregon, regarding a proposal that the city distribute electric current, is here presented in full. It comprises a succinct analysis which would be applicable to many other towns.—The Editor.)

Medford, Oregon, June 1, 1915.

To the Honorable Mayor and City Council of the City of Medford, Oregon.

Gentlemen:—I have the honor to present herewith, a report outlining the results of my investigation of the proposal of the Rogue River Public Corporation of Grants Pass and Chicago, with power sites at Grants Pass and Gold Hill, Oregon, to furnish the city of Medford electric current at wholesale rates, the city to distribute to the consumers.

There are several points in the proposition submitted by the Rogue River Public Service Corporation which would be undesirable from the city's standpoint, but as this proposition was tentative only, I shall not discuss them here as they could be corrected should the city deem it advisable to enter the field as a retailer of electric current to its citizens.

In this report I have not attempted to cover the details of power plant construction and equipment of the power sources of the above named corporation, nor the reliability of the service supplied by them nor their financial responsibility for two reasons, viz.:

First. The power plants, equipment, and transmission lines at this time are not completed.

Second. The question of greatest importance for the city to determine is: will an investment of this kind be a profitable one for the municipality?

If, after investigation, it were considered profitable, the questions of service reliability and financial responsibility, would be carefully determined.

Below is given the estimated load data covering the various classes of service in the city of Medford:

Class of Service.	Number of customers.	Connected load in kw.	Kw.-hrs. per month consumed by each class of service	Connected load per customer in kw's.	Average rate per Kw.-hr.	Monthly Income.
Residence lighting	1542	925	30,000	.60	.08	$2,400.00
Business lighting.	186	455	20,000	2.44	.05	1,000.00
Power	72	800	35,000	11.11	.03	1,050.00
Elec. air heating.	160	480	330,480	3.00	.0023	760.104
Electric cooking..	114	570	413,100	5.00	.0034	1,404.54
Water heating....	110	165	117,360	1.50	.0034	399.024
Cluster lights.....	...	12	.....	....	.....	.....
Series arcs.....	...	31	.....	....	.....	.....
Multiple arcs.....	...	12	.....	....	.....	.....
250-watt Mazdas..	...	2½	18,000	....	.0425	765,000
100-watt carbons..	...	2½	.....	....	.....	.....
City buildings.....	...	5	.....	....	.....	.....
Totals	2184	3460	963,940	....	.....	$7,778.668

Reproduction Cost of Distributing System and Equipment.

The reproduction cost new of the present distributing system substation, equipment and etc., as given by the Railroad Commission of Oregon (see File, U-F-97) is as follows:

Substation, lot and equipment	$ 17,767.61
Distributing system (poles, lines etc.)	114,342.03
Store, shop, office equipment and tools	28,894.91
Total	$161,004.55

I have taken the cost of reproduction to be $100,000 (which I consider too low) as a basis for calculation, and the following statements, based on this amount, give the estimated expenditures per month, to maintain a distributing system adequate to meet the demands of the city of Medford.

The expenditures per month to maintain the distributing system would be approximately as follows:

963,940 kw.-hr. of current at $.00775 per kw.-hr. (see Rogue River Public Service Corporation rate sheet)		$7,470.535
Interest on $100,000 at 6 per cent per annum		500.00
Depreciation at 6 per cent per annum		500.00
Insurance at 2½ per cent per annum		208.33
Sinking Fund at 6 per cent per annum		500.00
Operating Costs.		
1 Superintendent	$150.00	
1 Line Foreman	100.00	
4 Linemen at $85.00 each	340.00	
Repairs, materials, etc., not estimated	000.00	
Meter reading	75.00	
Postage	60.00	
Stationery	15.00	
Office Help.		
1 Cashier	100.00	
1 Billing Clerk	60.00	
1 Stenographer	60.00	
Incidentals	50.00	
	$1010.00	1010.00
Transmission Losses.		
Distributing lines.....10%		
Distributing transformers. 5%		....
Service lines 3%		
Meters 2%		
Total losses.....20% of $7470.00,	$1494.00	1494.00
Taxes Lost.		
Approximately 10 mills of $100,000.....	83.333	83.333
Total expenditures per month		$11,766.198
Total monthly income (from sheet No. 2)		$ 7,778.668
Total monthly expenditures (sheet No. 3)		11,766.198
Deficit		53,987.530

The reason for such an enormous deficit will be apparent when the following facts are considered, viz:

Medford probably has a larger heating and cooking load in proportion to population, than any city on the Pacific Coast, due to the low rate at present charged for this class of service. In order to meet competition, it would be necessary for the city to charge an equivalent flat rate or proportionate meter rate, to the present tariffs are as follows:

Electric air heating	approximately	$.0023	per kw.-hr.
Electric water heating	"	.0034	" "
Electric cooking	"	.0034	" "

This current would cost the city $.00775 per kw.-hr. hence this deficit.

While the city might desire not to handle this large heating and cooking load, it is my opinion it would be necessary to do so for the following reasons:

Were one corporation to handle the lighting load and another the heating and cooking load, this condition would require either two separate distributing systems with additional unsightly poles on the streets, or the joint occupancy of one set of poles with additional wires and transforming apparatus thereon, another unsightly condition. Consumers of electric current would possibly be adverse to dealing with two different corporations for electric current of two classes of service so closely allied.

"Satisfied customers" is the keynote to the success of any commercial enterprise and it would seem unwise for the city to conduct the retailing of electric current in such a manner as to lose the good will and confidence of its citizens and customers.

From my investigation of this matter, it appears that conditions are not expedient for this city to undertake the retail distribution of electric current.

Respectfully submitted,

LAURIN E. HINMAN,
City Electrical Inspector.

THE REGULATION OF PUBLIC UTILITIES BY COMPETITION IN THE SECURITIES MARKET.

BY F. K. BLUE.

[Concluded.]

This amortizing method may be applied to effect a purchase of public utilities by a municipality by fixing an arbitrary price for the service, say five cents for a street car ride, and then computing the difference between the actual earnings each year and the required earnings as estimated by the method of competitive investment, **F**, and crediting this difference in favor of the municipality toward the purchase of the property of the corporation. In this way a municipality can purchase an existing utility without assuming the responsibility of a bond issue, and still make the consumers pay for it instead of the taxpayers.

The quantity of product that is expected to be sold during the year for which the price is to be fixed, $\mathbf{Q} = f(\mathbf{q})$, say $\mathbf{Q_5} = (7q_1 + 4q_2 + q_3 - 2q_4)/10, = 48{,}000$ cu. ft. in the first year, is estimated by extrapolating a value based upon the actual quantities sold during several previous years. It is not necessary that the actual quantity finally sold should agree closely with this estimated quantity since all such discrepancies are fully compensated for by the system of virtual amortization of surpluses and deficits in earnings between the investor and the consumer.

In order to extend the bonus for a reduction in the cost of operation due to economy and efficiency, and the deficits due to negligence in this regard, over several years, the assumed unit cost of operation to be used in fixing prices, $\mathbf{U} = f(\mathbf{u})$, say $\mathbf{U_5} = (u_1 + u_2 + u_3 + u_4)/4, = \$0.58$ per thousand cu. ft. in the first year, is taken as an average of the actual unit cost of operation for several preceding years. Then, in a way similar to that in which profits due to individual initiative and economy and efficiency in production disappear in free competition just as soon as one's competitors can learn and adopt such improvements, so under competitive investment such profits finally disappear when the estimated unit cost of operation reaches the actual unit cost of operation. In the four year average assumed in the example the profit or loss due to changes in economy and efficiency disappears in the fifth year, but this time may be extended as long as deemed desirable by estimating the average unit cost for a greater number of years, if it be found that the bonus for improvements or penalty for negligence realized by this method during only four or five years will not afford a sufficient incentive to encourage that highest possible economy and efficiency in production that is becoming so necessary to our modern requirements of living. Properly the rewards for economy and efficiency belong not to those who receive dividends on investments but to those who in the real work of either management or manipulation actually accomplish such results. Until economic methods are adopted which will distribute such rewards where they belong, however, the time during which the investor receives such rewards may have to be extended beyond that which would otherwise be necessary or desirable. The principle is identical with that which determines the length of time during which patent rights should be protected as a monopoly. Also, it may be noted that purely speculative industries in which individual initiative plays the most important part are not at first monopolies and, therefore, do not need regulating except to protect investors from misleading statements of facts and prospects. Such ventures should all be treated like patent rights, however, and after a limited term be subjected to regulation on the basis of the actual investment in their properties.

The estimated cost of operation used in fixing prices, $\mathbf{C} = \mathbf{UQ}, = \$28$ in the first year, is the product of the estimated unit cost of production and the estimated quantity of product expected to be sold.

The estimated required gross earnings used as a basis for price-fixing, $\mathbf{E} = \mathbf{A} + \mathbf{C} = \mathbf{B} - \mathbf{a} + \mathbf{C}, = \$36$ in the first year, is the sum of the estimated required dividend on investment as adjusted by virtual amortization and the estimated cost of production.

Then the price of the product, $\mathbf{P} = \mathbf{E}/\mathbf{Q}, = \$0.75$ per thousand feet in the first year, is fixed at the ratio of the estimated required gross earnings to the estimated quantity of product expected to be sold.

The actual gain—loss when negative—which the security-holder realizes above a normal return on investment, $\mathbf{g} = \mathbf{d} - \mathbf{yV}, = 0$ in the first year, is shown by taking the difference between the actual return on investment and the return on the appraised value of the investment at the supposed actual market yield demanded by the public on the securities which represent the investment.

By crediting the gain and debiting the loss each year the balance of this loss and gain, or the actual accumulated surplus, for a period of years may be shown, $\mathbf{G} = \Sigma\mathbf{g}$.

Although this quantity could never in reality be exactly determined, it is assumed in the tabular example in order to show what the effects of the application of the method of competitive investment with amortization of fluctuating returns and the adjustment for conditional profits, would be in practice.

Principles Underlying the Methods of Competitive Investment and Conditional Profits.

Indicated rate of profit, $\mathbf{Y} = \mathbf{B}/\mathbf{v} = [\mathbf{Y}]\mathbf{V}/\mathbf{v}$, determined by the amount of estimated dividends required relative to the market value of the securities.

Estimated required dividend, $\mathbf{B} = [\mathbf{Y}]\ \mathbf{V} = [\mathbf{B}/\mathbf{v}]\ \mathbf{V}$, determined by the indicated yield of securities for the previous year applied to the established cost value of the investment.

Price, $\mathbf{P} = \mathbf{E}/\mathbf{Q} = (\mathbf{B} - \mathbf{a} + \mathbf{UQ})/\mathbf{Q}$, determined by the estimated required dividend, less the amount to be amortized, added to the estimated cost of operation, and the sum divided by the estimated quantity of product expected to be sold.

Indicated required dividend, $\mathbf{D} = \mathbf{YV}$, determined by the indicated yield of the securities applied to the established cost value of the investment.

Difference between the actual and the indicated dividends virtually amortized between investor and consumer by subtracting or adding each year the accumulated adjusted surplus or deficit between the actual and indicated earnings, $\mathbf{a} = \frac{1}{2}\Sigma(\mathbf{e} - \mathbf{Uq} - \mathbf{D})$, to the estimated required dividend, **B**.

Tabular Example.

Year.	Appraised Value of Investment. V given	Estimated Required Dividend. B [Y]V	Amount Virtually Amortized. a ½[S]	Adjusted Required Dividend. A B − a	Quantity Expected to Be Sold. Q f(q)	Estimated Unit Cost of Operation. U f(u)	Estimated Total Cost of Operation. C UQ	Estimated Required Gross Earnings. E A + C	Price of Product. P E/Q	Actual Quantity Sold. q given	Actual Gross Earnings. e Pq	Actual Total Cost of Operation. c given	Actual Unit Cost of Operation. u c/q	Market Value of Securities. v given	Indicated Yield of Securities. Y B/v	Indicated Required Dividend. D YV	Adjusted Total Cost of Operation. K Uq	Adjusted Required Gross Earnings. F D + K	Adjusted Surplus. s e − F	Accumulated Adjusted Surplus. S Σs	Dividend Actually Available. d e − c	Required Market Yield of Securities. y	Actual Required Dividend. yV	Actual Surplus. g d − yV	Actual Accumulated Surplus. G Σg
1	$160.00	8.00	.....	8.00	48	.58	28.00	36.00	.75	48	36.00	28.00	.58	160.00	.05	8.00	28.00	36.00	.....	.....	8.00	.05	8.00	.....	.....
2	200.00	10.00	.....	10.00	48	.58	28.00	38.00	.79	48	38.00	28.00	.58	200.00	.05	10.00	28.00	38.00	.....	.....	10.00	.05	10.00	.....	.....
3	200.00	10.00	.....	10.00	48	.58	28.00	38.00	.79	60	47.50	35.00	.58	200.00	05	10.00	35.00	45.00	2.50	2.50	12.50	.05	10.00	2.50	2.50
4	200.00	10.00	1.30	8.70	56.4	.58	32.90	41.60	.74	60	44.30	35.00	.58	200.00	.05	10.00	35.00	45.00	—.70	1.80	9.30	.05	10.00	—.70	1.80
5	200.00	10.00	.90	9.10	61.2	.58	35.70	44.80	.73	60	44.00	35.00	.58	200.00	.05	10.00	35.00	45.00	—1.00	.80	9.00	.05	10.00	—1.00	.80
6	200.00	10.00	.80	9.20	62.4	.58	36.40	45.60	.73	60	43.80	35.00	.58	200.00	.05	10.00	35.00	45.00	—1.20	—.40	8.80	.05	10.00	—1.20	—.40
7	200.00	10.00	—.40	10.40	60	.58	35.00	45.40	.76	60	45.40	35.00	.58	200.00	.05	10.00	35.00	45.00	.40	.....	10.40	.05	10.00	.40	.....
8	200.00	10.00	.....	10.00	60	.58	35.00	45.00	.75	60	45.00	44.00	.73	195.60	.051	10.20	35.00	45.20	—.20	—.20	1.00	.05	10.00	—9.00	—9.00
9	200.00	10.20	—.20	10.40	60	.62	37.20	47.60	.79	60	47.60	44.00	.73	197.40	.052	10.30	37.20	47.50	.10	—.10	3.60	.05	10.00	—6.40	—15.40
10	200.00	10.30	—.10	10.40	60	.66	39.50	49.90	.83	60	49.90	44.00	.73	198.80	.052	10.40	39.50	49.90	...	—.10	5.90	.05	10.00	—4.10	—19.50
11	200.00	10.40	—.10	10.50	60	.69	41.40	51.90	.87	60	51.90	44.00	.73	200.30	.052	10.40	41.40	51.80	.10	...	7.90	.05	10.00	—2.10	—21.60
12	200.00	10.40	.....	10.40	60	.73	44.00	54.40	.91	60	54.40	44.00	.73	201.40	.051	10.20	44.00	54.20	.20	.20	10.40	.05	10.00	.40	—21.20
13	200.00	10.20	.20	10.00	60	.73	44.00	54.00	.90	60	54.00	44.00	.73	200.00	.050	10.00	44.00	54.00	...	.20	10.00	.05	10.00	....	—21.20
14	200.00	10.00	.20	9.80	60	.73	44.00	53.80	.90	60	53.80	44.00	.73	200.00	.050	10.00	44.00	54.00	—.20	...	9.80	.05	10.00	—.20	—21.40
15	200.00	10.00	.....	10.00	60	.73	44.00	54.00	.90	60	54.00	44.00	.73	186.40	.054	10.70	44.00	54.70	—.70	—.70	10.00	.07	14.00	—4.00	—4.00
16	200.00	10.70	—.70	11.40	60	.73	44.00	55.40	.92	60	55.40	44.00	.73	188.80	.057	11.40	44.00	55.40	...	—.70	11.40	.07	14.00	—2.60	—6.60
17	200.00	11.40	—.70	12.10	60	.73	44.00	56.10	.93	60	56.10	44.00	.73	191.10	.060	11.90	44.00	55.90	.20	—.50	12.10	.07	14.00	—1.90	—8.50
18	200.00	11.90	—.50	12.40	60	.73	44.00	56.40	.94	60	56.40	44.00	.73	192.60	.062	12.40	44.00	56.40	...	—.50	12.40	.07	14.00	—1.60	—10.10
19	200.00	12.40	—.50	12.90	60	.73	44.00	56.90	.95	60	56.90	44.00	.73	194.70	.064	12.80	44.00	56.80	.10	—.40	12.90	.07	14.00	—1.10	—11.20
20	200.00	12.90	—.40	13.30	60	.73	44.00	57.30	.95	60	57.30	44.00	.73	195.20	.066	13.30	44.00	57.30	...	—.40	13.30	.07	14.00	—.70	—11.90
21	200.00	13.30	—.40	13.70	60	.73	44.00	57.70	.96	60	57.70	44.00	.73	196.90	.067	13.50	44.00	57.50	.20	—.20	13.70	.07	14.00	—.30	—12.20
22	200.00	13.50	—.20	13.70	60	.73	44.00	57.70	.96	60	57.70	44.00	.73	197.80	.068	13.70	44.00	57.70	...	—.20	13.70	.07	14.00	—.30	—12.50
23	200.00	13.70	—.20	13.90	60	.73	44.00	57.90	.96	60	57.90	44.00	.73	198.70	.069	13.90	44.00	57.90	...	—.20	13.90	.07	14.00	—.10	—12.60
24	200.00	13.90	—.20	14.10	60	.73	44.00	58.10	.96	60	58.10	44.00	.73	199.70	.070	14.00	44.00	58.00	.10	—.10	14.10	.07	14.00	.10	—12.50
25	200.00	14.00	—.10	14.10	60	.73	44.00	58.10	.97	60	58.10	44.00	.73	200.00	.070	14.00	44.00	58.00	.10	...	14.10	.07	14.00	.10	—12.40
26	200.00	14.00	.....	14.00	60	.73	44.00	58.00	.97	60	58.00	44.00	.73	200.00	.070	14.00	44.00	58.00	...	...	14.00	.07	14.00	.....	—12.40
27	160.00	11.20	.....	11.20	60	.73	44.00	55.20	.92	48	44.20	28.00	.58	173.00	.065	10.30	35.20	45.50	—1.30	—1.30	16.20	.05	8.00	8.20	8.20
28	160.00	10.30	—.70	11.00	51.6	.69	35.80	46.80	.91	48	43.50	28.00	.58	170.40	.060	9.70	33.30	43.00	.50	—.80	15.50	.05	8.00	7.50	15.70
29	160.00	9.70	—.80	10.50	46.8	.66	30.80	41.30	.88	48	42.40	28.00	.58	167.50	.058	9.20	31.60	40.80	1.60	.80	14.40	.05	8.00	6.40	22.10
30	160.00	9.20	.80	8.40	45.6	.62	28.20	36.60	.80	48	38.50	28.00	.58	164.80	.056	8.90	29.80	38.70	—.20	.60	10.50	.05	8.00	2.50	24.60
31	160.00	8.90	.60	8.30	48	.58	28.00	36.30	.76	48	36.30	28.00	.58	163.10	.055	8.70	28.00	36.70	—.40	.20	8.30	.05	8.00	.30	24.90
32	160.00	8.70	.20	8.50	48	.58	28.00	36.50	.76	48	36.50	28.00	.58	162.60	.053	8.50	28.00	36.50	...	.20	8.50	.05	8.00	.50	25.40
33	160.00	8.50	.20	8.30	48	.58	28.00	36.30	.76	48	36.30	28.00	.58	162.20	.052	8.30	28.00	36.30	...	.20	8.30	.05	8.00	.30	25.70
34	160.00	8.30	.20	8.10	48	.58	28.00	36.10	.75	48	36.10	28.00	.58	161.70	.051	8.10	28.00	36.10	...	.20	8.10	.05	8.00	.10	25.80
35	160.00	8.10	.20	7.90	48	.58	28.00	35.90	.75	48	35.90	28.00	.58	161.00	.050	8.00	28.00	36.00	—.10	.10	7.90	.05	8.00	—.10	25.70
36	160.00	8.00	.10	7.90	48	.58	28.00	35.90	.75	48	35.90	28.00	.58	160.00	.050	8.00	28.00	36.00	—.10	.....	7.90	.05	8.00	—.10	25.60
37	160.00	8.00	.....	8.00	48	.58	28.00	36.00	.75	48	36.00	28.00	.58	160.00	.050	8.00	28.00	36.00	...	.....	8.00	.05	8.00	.....	25.60

Note.—It may be explained that the computations in the table are not always exact according to the given formulas, because it is not desirable for purposes of illustration to carry out the figures to a greater number of decimal places, and also because the theory would, in some cases, require an infinite number of terms if the computations were exact.

.....represents 0.00 (zero).

Profits are made to depend upon economy and efficiency in production by using the adjusted cost of operation, **Uq**, instead of the actual cost of operation, **c**, in computing the annual sum to be amortized between the investor and the consumer.

Formulas Used in Making Up Tabular Example.

$Q_5 = (7q_4 + 4q_3 + q_2 - 2q_1)/10$ for estimating quantity of product expected to be sold.

$U_5 = (u_4 + u_3 + u_2 + u_1)/4$, average unit cost of operation for several preceding years, used in fixing prices of product.

$v = V + 3\,(B - yV) + (e - c - yV - s)/2$ is a somewhat arbitrary formula used in the tabular example in assuming a value for the securities which would approximately equal the discounted value of their probable future earnings.

Description of Tabular Example.

To show the effect of changes in the quantities, **V, q, u, y,** on which the operation of the method of competitive investment is based, these quantities are increased in the tabular example, first one at a time until normal relations are in each instance restored, and finally all of these quantities are returned at the same time to their former values. Thus, in the second year the share of the actual capital investment, **V,** is assumed to be increased from $160 to $200. This results only in an increase in price, **P**, from $0.75 to $0.79 per thousand, and a corresponding increase in the market value of the securities, **v,** from $160 to $200. There are no amounts to be amortized and no divergence from normal earnings. However, if a considerable investment in new construction not required for present needs would unduly raise the price of the product, then an arbitrary price might be fixed at a reasonable figure and the resulting deficits in earnings be amortized by degrees over a term of years.

In the third year of the example the quantity of gas, **q,** sold is assumed to increase from 48,000 to 60,000 ft. This causes a considerable increase in the earnings, **e,** which is amortized out by the seventh year. On this account there is no reason for any change in the market value of the securities but the amortizing process will cause a considerable compensating fluctuation in price before bringing it back to normal at $0.75. The fluctuation in price may be reduced as much as desired by extending the amortization over a longer term of years.

In the eighth year the unit cost of operation, **u,** is assumed to rise from $0.58 to $0.73 per thousand. This immediately causes a deficit of nearly the whole of the amount available for dividends during the year, but on account of the application of the principle of conditional profits this deficit is not amortized out but remains as a loss to the security holder. On account of this loss the market value of the securities will naturally decrease a little, temporarily, but the price of the gas will finally be automatically raised from $0.75 to $0.90 to cover the increased cost of production, and so will then stop the loss of earnings to the security holders. In the example stable conditions are reached again in the fourteenth year.

In the fifteenth year the rate of profit or yield of securities, **y,** demanded by the public for such investments is assumed to have risen from 5 to 7 per cent. On the new basis of required profit this will cause a deficit in the yield of the securities at their old valuation. Their market valuation then will naturally fall until equal to the discounted value of all their probable future returns—taking into consideration the normal operation of the method of competitive investment—but the final result will be that the price of the gas will be raised from $0.90 to $0.97, which is sufficient to bring the market value of the securities again to an equality with their appraised value. This condition is reached in the twenty-sixth year.

In the twenty-seventh year all of the four quantities, **V, q, u,** and **y,** are assumed to be reduced simultaneously to their original values in order to show how the method works out when all of the variables are changing at the same time. In this case the original conditions are reached again in the thirty-seventh year.

CORRECT TEMPERATURES FOR ELECTRIC COOKING.

As the result of an exhaustive series of experiments on the economic operation of electric ovens Mr. P. W. Gumaer, in a paper presented at the annual convention of the American Institute of Electrical Engineers, concluded that the most economical temperature for preparing rare and medium rare roasts is 100 deg. Cent. For well done roasts 120 deg. Cent. is the most economical temperature. With electricity at $.05 per kw.-hr. it is at least $.02 cheaper to roast beef at 100 to 120 deg. Cent. than at 180 deg.

It was found that at least 1000 watt-hr. could be saved by searing the roast on top of the stove instead of heating the whole oven up to 250 deg. Cent.

The range of oven temperatures for baking biscuits was found to be from 200 to 240 deg. Cent. Starting with the oven at the required temperature, the energy used in baking biscuits is practically the same for all oven temperatures. If it is necessary to heat up the oven from room temperature, the most economical oven temperature is the lowest which will give satisfactory results; i. e., about 200 deg. Cent.

The range of oven temperatures for baking a small size loaf of bread was found to lie between 180 and 240 deg. Cent. Starting with the oven at the required temperature, the most economical temperature for baking bread is between 220 and 240 deg. Cent. When preheating is included, the most economical temperature for a small size loaf was found to be between 200 and 215 deg. Cent.

The range of oven temperatures for baking sponge cake was found to lie between 170 and 190 deg. Cent. For baking sponge cake the most economical oven temperature is the highest temperature which will give satisfactory results; i. e. about 190 deg. Cent.

The results of the cooking experiments in electric ovens indicate that it is possible to reduce the art of cooking with electricity to an exact science. If definite rules of time and temperature were formulated for cooking each article of food, the inexperienced housewife could obtain uniformly good results with the expenditure of a minimum amount of attention and fuel.

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POWER AND GAS

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Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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An Unjust Tax

To those acquainted with the inadequacy of the Ferris Bill as an encourager of water power development, its endorsement by the National Electric Light Association's public policy committee came as a distinct shock. This is yet another instance of the failure of Eastern men to understand Western conditions.

That the Ferris Bill even in its amended form, cannot remove the present restrictions to the growth of the hydroelectric industry in the West, has recently been demonstrated in these columns by Mr. Henry J. Pierce of Seattle. But in his desire to present a proposition which would be acceptable both to the practical and to the theoretical conservationists, those who would conserve by wise utilization, and those who would waste by non-use, Mr. Pierce has laid insufficient emphasis upon one feature of the bill which is manifestly unjust,—this being the proposed tax upon the amount of power developed or sold.

Under the provisions of the bill the Secretary of the Interior is authorized to collect charges or rental for the occupancy of federal lands. At his discretion these charges may be based upon the amount of power sold. Mr. Pierce suggests that these charges be "reasonable," the reasonableness to be determined by the U. S. District Court in case the Secretary of the Interior and the lessee cannot agree. But this tacit admission of the justice of any federal charge predicated upon the amount of power sold gives a loophole for the pretext that federal ownership of land confers the power of control and taxation over state owned water which flows over that land.

The courts have recognized that the ownership of water is vested in the state. The state and not the nation has the right to make water laws, excepting in the case of navigable streams. The state public service commissions are regulating all public utilities so that the nation no longer has a legitimate object in seeking to regulate them.

Yet the bureaucrats who are seeking a method of perpetuating their powers and hunting for a means of acquiring funds for their departments have agreed that the power companies seem to be rich and therefore offer an easy prey for taxation. The conversational conservations have sedulously fostered the sophism that a power site is often worth millions of dollars, whereas as a matter of fact it has no value beyond the worth of the land it occupies. The value resides not in the reservoir or power site, but in the water which might be retained on that site after proper dams and other engineering structures are installed. Any federal charge should be merely a reasonable rental for the use of land occupied by conduits, reservoirs, transmission lines and other appurtenances of a power development.

The elimination of the tax would in no way interfere with the present harmonious arrangements

between state and national officials, as is described elsewhere in this issue by Mr. Leonard Lundgren. The fullest co-operation in the control of state water on federal lands can be continued without the imposition of a national excise on the amount of power generated.

There is immediate need, while there is yet time, for the people of the West to recognize and provide against the danger of the pernicious doctrine. Any congressional legislation should specifically state that federal charges are only for rental purposes, as otherwise any tax on power output will merely add to the charge which must ultimately be borne by the consumer. While the Ferris Bill is at fault in several other details, as will be shown at some later time, this provision is so unjust and fallacious as to call for widespread understanding of the evils of non-utilization which will follow in its wake.

A Plea for Sanity

The material progress of the past century has annihilated time and space and revolutionized methods of doing things. There are men now living who remember the horse as the fastest means of land locomotion, the sail the speediest on the sea and the candle as the best means for lighting. Each new improvement has, in turn, made necessary some new development, not only mechanically, but industrially. The big industrial corporation, for example, has been merely a readjustment of business methods to meet the conditions imposed by the steam locomotive and the telegraph.

All this machinery, which has aptly been called the subconscious mind of the world, now threatens to become master of its creator. Much as the ancient Grecian sculptor Pygmalion is reputed to have become captive to the charms of his statue Galatea, modern man is now being run by the machines which he made to run.

When the subconscious, or subjective, mind of man assumes control of his actions he is said to be insane. Reason abdicates her throne. The objective mind becomes the servant of the irresponsible subjective mind. Likewise many men are now machine-mad.

The machines which men have contrived take first place in their thought. After a machine has once been made it must be kept going, the fire must not go out, the melt must not be chilled, continuity of service must be maintained at all cost, for otherwise the owner will suffer loss. The need which the machine was originally designed to meet takes second place. And so we find men ruled by the complex mechanism of civilization, with its arbitrary conventions and useless procedure. Thus do the means become the end of existence.

The modern problems of capital and labor and other forms of social unrest, upon analysis, will be found not to be clash between class and class, but the chaffing of all classes under the limitations set up by the economic mechanism. The case is parallel to that of the fictional character of Frankenstein who gave a semblance of life to a monster which he had contrived from the refuse of the dissecting room. Rendered frantic by his unsatisfied human cravings the creature finally destroyed his creator as the climax of a series of dreadful retributions.

An unbiased student of humanity may see the present European war as an inevitable and eventual breaking down of certain artificial barriers. Some hope to see similar results accomplished by a process of evolution rather than revolution after men have been educated to a realization of the futility of misdirected efficiency, persistency, method and discipline. We need men with a vision of the purpose of existence, an understanding of the brotherhood of man and the courage to point out that the mere pursuit of wealth and material civilization is not the goal which leads to human happiness.

Mobilization of Engineering Talent

A well-founded feeling of satisfaction pervades the engineering and scientific ranks throughout the United States because of Secretary Daniels' plan to establish a consulting department of civilian engineers to advise on methods of national defense. It augurs well for the success of the undertaking that Thomas A. Edison has consented to act as head of this board of invention and it is expected that many engineers and inventors will enlist in this patriotic service.

This proposal is in line with a similar suggestion made in London last month by H. G. Wells, wherein the political leaders and the war office were invited to avail themselves of the assistance of scientific men and methods in the conduct of the war. Engineers welcome this suspension of the moratorium which has existed ever since the distinction was first drawn between military and civil engineering. They have long felt the obligation of this debt but have hesitated to offer their services at times when the public had not recognized their value.

While there are many men of undoubted patriotism who are not in sympathy with the utilization, for destructive purposes, of knowledge that has hitherto only been applied to constructive endeavor, the exigencies of the case demand that some sacrifice of feeling be made. The automobile, the aeroplane and the submarine are triumphs of engineering ingenuity which have proven invaluable in warfare. The telephone and wireless telegraph likewise have been pressed into military service. But now it seems necessary to call upon the proverbial Yankee inventive ability to construct new engines of destruction to defeat those already devised.

While the great majority of thinking men deplore the necessity which has called for this action of defense and while they cannot but feel that the existence of an instrument for performing an action is the cause of that action being performed, they realize that protection is necessary where peace, law and righteousness are wantonly cast aside.

PERSONALS

F. E. Blake, general manager Hawaiian Electric Company, is at San Francisco.

H. W. Lewis, of the Lewis Electric Company, Fresno, was a visitor at San Francisco during the week.

E. M. Cutting, manager Edison Storage Battery Supply Company, San Francisco, is at Los Angeles.

A. S. Crane, vice-president of J. G. White Engineering Corporation, is expected at San Francisco this week.

C. L. Cory, electrical engineer at San Francisco, has returned from a business trip to Los Angeles.

Thos. W. McCullough, electrical contractor of Gridley, Cal., spent a few days at San Francisco during the first of the week.

H. V. Carter, president Pacific States Electric Company, San Francisco, is on a trip to Los Angeles and Southern California.

N. R. Putnam, sales manager of the Utah Power & Light Company, at Salt Lake City, Utah, was a recent visitor at San Francisco.

Hisao Natayama, professor of electrical engineering, College of Technology, Tokio, is a visitor at San Francisco, en route to the East.

R. H. Ballard, assistant manager of the Southern California Edison Company, is spending a two weeks' vacation at Lake Tahoe with his family.

N. G. Symonds, manager of the prime mover division of the Chicago office of the Westinghouse Electric & Manufacturing Company, is at San Francisco.

C. G. A. Baker, vice-president and treasurer Baker-Joslyn Company, is in Portland this week and will be in Seattle next week on company business.

H. F. Yost, of the sales force Electric Railway & Manufacturers' Supply Company, San Francisco, has returned to San Francisco after a several weeks' trip through Nevada.

Arthur L. Peat, comptroller of the San Joaquin Light & Power Corporation, has returned to Los Angeles from San Francisco, where he spent a few days on company business.

M. C. McNeil, turbine engineer of the prime mover department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., recently spent a few days at San Francisco.

L. R. Jorgensen, consulting engineer at San Francisco, is supervising the construction of two multiple arch dams being erected by the Pacific Power Company on Rush Creek, California.

L. M. Barrick, assistant secretary and treasurer of the Union Metal Manufacturing Company, Canton, Ohio, spent the week at San Francisco while on a business trip to the Pacific Coast.

H. S. Wells has resigned as new business manager for the Pacific Power & Light Company at Portland, Ore., to join the industrial power division of the Utah Power & Light Company at Salt Lake City.

Henry Floy, consulting engineer of New York City is at Visalia, Cal., in connection with an examination of the Mt. Whitney Power & Electric Company's plants which he is making for the U. S. Department of the Interior.

H. S. Perkins, formerly of Boston and Detroit, has opened Pacific Coast offices at 121 Second street, San Francisco as district manager for J. H. Parker, Inc., and of J. H. Parker & Sons, distributors of electrical porcelain.

Samuel C. Jagger, proprietor of the Morrison Electric Company, Portland, Ore.; **F. H. Murphy** and **A. R. Kolls** have been appointed to three year terms as members of the Portland Board of Appeals provided for in the building inspection code.

J. Harry Pieper, the active president of the Los Angeles Jovians, and also the president of the Los Angeles Ad Club, presided over a meeting of the latter club last Thursday, at which former Secretary of State W. J. Bryan made the principal address.

C. M. Will, Portland manager of the Fobes Supply Company, was married to Miss Hazel Weller, of Portland, Ore., on June 27th. "On his return, after two weeks of honeymoon, he found a baby buggy with (doll) inmate chained and padlocked to his desk."

G. R. C. Conway, who has filled the position of chief engineer of the B. C. Electric Railway since January, 1911, has resigned his position in order to take up work as general consulting engineer at Toronto. In connection with his general work, Mr. Conway has been appointed as consulting engineer for the B. C. Electric Railway. His term of service covered an era of rapid development, including the construction of the great dam at the outlet of Lake Coquitlam; the enlargement of the company's No. 1 power house on the North Arm of the Inlet, and the construction of the new No. 2 power house, thereby increasing the company's output from the Coquitlam-Buntzen hydraulic project to over 85,000 h.p.; the construction of a 130 foot dam on the Jordan River, Vancouver Island, and the consequent enlargement of the Jordan River power plant to a capacity of 20,000 h.p.; the construction of a steam auxiliary plant at Brentwod Bay, on the Island, and the enlargement of the Vancouver steam auxiliary plant; the construction of the Saanich Interurban line on the Island, as well as the laying of many extensions of lines both on the Mainland and the Island. In addition to these large undertakings, he has carried out extensive work in the provision of substations, etc., whereby the company's service has been greatly improved. The retirement of Mr. Conway from the company's service was marked by a complimentary dinner tendered him by officials of the B. C. Electric at the Hotel Vancouver on June 26th. General Manager Kidd presided at this gathering and read a cablegram from the London Board of the Company expressing regret at the retirement of Mr. Conway and the appreciation of his good work done for the company. The general manager and representatives of the company from all points of its field of work expressed at this dinner their high personal regard for Mr. Conway, both as a man and an engineer, and all joined in wishing him great success in his new field of work. The office staff of the B. C. Electric recognized the departure of Mr. Conway from the company's active service by the presentation of a handsome solid silver rose bowl, mounted on an oak base. Mr. Conway leaves the service of the B. C. Electric with hearty wishes for his success in his new field of work from every employe of the company as well as from prominent citizens of the districts within the company's territory, with whom he has participated in many projects for the betterment of public conditions.

MEETING NOTICES.

National Electrical Contractors at Los Angeles.

On their way to the national convention at San Francisco, a party of about eighty of the members of the National Electrical Contractors' Association and their ladies stopped off at Los Angeles for a day, and were taken in hand by the Southern California Electrical Contractors' and Dealers' Association, of which J. C. Rendler is president. The party was met at the train, feasted and taken to Universal City, where the mysteries of the moving picture industry were explained to them, and where they witnessed some wonderful lighting effects, produced by Electrician Harry Brown of Universal City. The party then journeyed through Hollywood to the beaches and by special permit the line of autos paraded along the ocean front. After that a most enjoyable evening was spent at Venice-by-the-Sea.

American Association for the Advancement of Science.

During the week beginning August 2d, the American Association for the Advancement of Science will hold an extensive series of meetings in San Francisco and vicinity. This will be the first meeting west of the Rocky Mountains of this organization of more than nine thousand members, representing all fields of scientific research. Over twenty other societies organized in various branches of science will also convene at the same time or will participate in joint meetings during the week. The general sessions of the Association as a whole, including the opening session on Monday morning, August 2d, and four general addresses on the evenings of August 3d, 5th, 6th and 7th, will occur in the Scottish Rite Auditorium, corner of Van Ness avenue and Sutter street, San Francisco. Among the subjects of these addresses are:

"The Geologic and Biologic Problems of the Pacific Islands," by Professor R. A. Daly of Harvard University.

"The Influence of Former Separation of North and South America on the Evolution of the Faunas of America," by Professor W. B. Scott of Princeton University; and

"The Economic Future of the Pacific," by Dr. Paul S. Reinsch, American Ambassador to China.

This meeting is in a sense a part of the celebration commemorating the completion of the Panama Canal, which will bring into closer touch with other part of the world than ever before the lands on both the Asiatic and American borders of the Pacific Ocean. In preparing the program for the meetings special attention accordingly has been given to those problems of world-wide concern which pertain especially to this Pacific area. In addition to papers upon Pacific subjects there will be many contributions upon more general topics of scientific interest. The branches of science included in this series of meetings are: Astronomy, mathematics, physics, geology, paleontology, seismology, zoology, genetics, botany, psychology, anthropology, archeology, education and agriculture.

Northern California Association of Electrical Contractors.

The annual meeting of the Northern California Association of Electrical Contractors was held at San Francisco July 19th, being preceded by a get-together luncheon at a downtown cafe. President C. V. Schneider presided, and after roll-call the annual reports of the president and secretary were presented and adopted, showing a marked growth in membership on the part of the organization. In the election of officers which followed, C. V. Schneider was re-elected president, and in accepting the office for the third time assured the members of his appreciation of the honor and confidence bestowed upon him. The vice-presidents elected for the ensuing term were: San Francisco section, Messrs. Boynton and Reid; District No. 2, Loveday; District No. 3, Messrs. Gilpin and Nagel; District No. 4, Powell; District No. 5, Somers. W. S. Hanbridge was re-appointed secretary.

L. R. Boynton addressed the members on what had been accomplished through co-operation with the jobbers, the protection such action would afford contractors in the maintenance of uniform prices and anticipated still closer harmonious working arrangements for the future. Vice-President Gilpin spoke of the strides made by the Oakland district, the local organization now consisting of 50 members, all actively participating in the work of the association and the successful co-operation with the jobbers. As representative of the San Jose district, Frank Somers reported of the progress made with the central station in inducing it to give up the sale of electric appliances and lamps, it being contended this rightfully belonged to the scope of the electrical dealer. C. F. Butte, for the Price Book Committee, reported the work completed and the book ready for the press. It was the sense of the meeting that members should co-operate with their various lighting companies in seeing that lamps of suitable standards were used by patrons, and wherever possible intelligent data would be given that the consumer might get the highest efficiency from his lighting installation. Those present at the meeting were:

Alameda Electric Co.
Andrews, S. H.
Berkeley Electric Con. Co
Butte Eng. & Electric Co.
Capitol Electric Co.
Central Electric Co.
Central States Electric Co.
Century Electric Co.
Cooper Electric Co.
Decker Electric Co.
Electric Construction Co.
Electric Motor & Machy. Co.
Electric Supply Co.
Gas & Electric Appliance Co.
General Electric Constr. Co.
Hanbridge, W. S.
Hayes Electric Co.
Hunt, J. A.
Kimball Electric Co.
Kings Electric Co.
Kohlwey, W. D.
Manhattan, El. Co.
Ne Page, McKinny.
Pacific Fire Extinguisher Co.
Piedmont Electric Co.
Pioneer Electric Co.
Rialto Electric Co.
Richmond Electric Co.
Turner Co.
Western Transformer Co.
White, R. C.
Loveday, C.
Boynton Electric Co.
Wilson El. Co.

TRADE NOTES.

The Fobes Supply Company will shortly move into a building being erected for them at 281-287 Couch street, Portland, Oregon.

A. W. Parks is installing the electric wiring in the new building being erected at 281-287 Couch street by R. L. Glisan, Portland, Oregon.

The Pacific States Electric Company is going to erect a new building at Fifth and Davis streets, Portland, Oregon. Construction will begin in the near future.

Miller & Halls are doing the alteration job in the building on the southwest corner of Sixth and Washington streets, Portland, Oregon; also they have the electrical contract for the electrical equipment of the new Mason, Erhmon Company's warehouse.

Kendall Bros. of Pittsburg, Pa., have let the contract for a sawmill of 200,000 feet daily capacity to be erected near Roseburg, Ore., to the Allis-Chalmers Manufacturing Company. The entire plant will be motor-driven, being supplied from the electric power plant to be built on the property.

The Pelton Water Wheel Company of San Francisco and New York announces that the following honors have been conferred on its exhibit at the Panama-Pacific International Exposition: Grand prize for water wheels and accessories; gold medal for turbine pump; silver medal for high service pumps.

Allis-Chalmers Manufacturing Company, through its San Francisco office has sold to the California Pine Box Lumber Company, complete electric equipment for a new plant at Portola, Cal. The motor equipment includes 52 motors, totalling 906 h.p., including two large motors on the blowing system. Current is supplied 480 volt, 60 cycle, from a 500 kw. 3-phase, turbo alternator, 80 per cent power factor, Stirling boilers supplying steam. The installation is complete with switchboard and lighting transformer apparatus.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The commission has issued a supplemental order in the application of the Southern Counties Gas Company to use the proceeds from the sale of $150,000 of its 3 year 6 per cent gold notes to pay certain notes and accounts payable. Permission to do this was granted April 1, 1915, and later the applicant sought authority to use a part of the money from this sale of notes to buy $20,000 par value of its first mortgage bonds for sinking fund purposes. This permission is now given by the commission on condition that the bonds be placed in a sinking fund provided under applicant's first mortgage and deed of trust.

The Del Norte Peoples Telephone Company has filed an application with the commission for consent to the renewal of a note for $1000 for one year at 9½ per cent to the Bank of Crescent City, at Crescent City, Del Norte County.

The Oro Electric Corporation has filed an application with the railroad commission for permission to extent and renew for not over a year, from July 15, 1915, at 6 per cent,

the following promissory notes: Standard Oil Company, $5000; Pierson, Roeding & Company, $1500; General Electric Company, $12,000; Chas. C. Moore & Company, engineers, $5000; John A. Roeblings Sons Company of California, $2500. Totalling $26,000.

The Sierra Madre Telephone & Telegraph Company of Sierra Madre, Los Angeles Coounty, has filed an application with the commission for authority to renew five promissory notes for a total of $8000 from one to four years.

The commission has issued an order authorizing the Southern Sierras Power Company to execute a mortgage and trust deed for an unfixed amount to the Los Angeles Trust & Savings Bank and the International Trust Company of Denver, trustees, dated January 1, 1915, and to issue $3,668,000 of first and refunding Series "A" 6 per cent 50 year gold bonds.

The Half Moon Bay Light & Power Company has filed an application with the commission for authority to renew a note to the First National Bank of Livermore for $3000 at 8 per cent, payable in six months from June 27, 1915.

The Sacramento Valley & Eastern Railway and the Noble Electric Steel Company have filed an application with the commission for permission for the former to lease to the latter until December 31, 1918, the standard gauge railroad it owns in Shasta county, running from Pitt on the Sacamento River, along the north bank of that river, to Bully Hill.

NEWS OF WASHINGTON PUBLIC SERVICE COMMISSION.

Despite the displacement of gas for lighting purposes by electricity, the public service commission, in formal findings of fact in the valuation proceedings against the Seattle Lighting Company, which supplies that city with gas, finds that its business has been increased during the ten years since 1904 at a greater rate than any other public utility. In the ten year period from 1904 to 1914, the commission finds, the population of Seattle increased approximately 200 per cent, the mileage of its street railway lines 200 per cent, the mileage of water mains 250 per cent, and the number of telephones 320 per cent. The number of gas services in the same period increased 365 per cent, the investment in the plant 330 per cent, and the mileage of mains 290 per cent.

NEWS OF ARIZONA CORPORATION COMMISSION.

With regard to the contention of the Town of Tempe that the Mountain States Telephone & Telegraph Company should maintain the same rates and supply the same number of free telephones as prescribed in a franchise with the Overland Telephone & Telegraph Company, a company which was afterwards absorbed by the existing company, the commission has ruled that the city had no power to make any contract for any extended period of time governing telephone rates, and, furthermore, that such free telephone service is illegal.

As a compromise of the injunction against the order of the commission, which had been obtained by the Pacific Gas & Electric Company upon appeal to the Federal Court in November, 1913, wherein the court held that the commission had erred in not allowing a valuation for a certain contract with the United States Government, in making insufficient allowance for working capital, overhead charges and going value, an appraisal has been completed of the company's properties by W. J. Freeman and R. S. Masson. This shows a present value of $979,779, of which $575,845 is for physical value. The present rates are continued until such time as the annual rate of return exceeds 10 per cent of their current value.

The commission has authorized the Pacific Gas & Electric Company to publish, to become effective July 1, 1915, a rate or minimum charge of not more than $1.50 for electric service rendered to any consumer for a period not in excess of thirty days, and not more than $1 for gas service rendered to any consumer for a period not in excess of thirty days, and when both electric and gas service is rendered to one consumer for such short time periods, a charge for such dual service shall not exceed $2.

The Mountain States Telegraph & Telephone Company has been authorized to sell its lines from Prescott to Marlow's ranch to the United States Government, and from Marlow's ranch to Iron Springs to the Iron Springs Outing Club.

The commission has denied a petition for an order requiring the Phoenix Railway to construct a 6-block loop, but has directed the company to double track and make extensions to certain portions of its lines.

The commission has investigated the autobomile traffic on stage lines between Phoenix and Globe, and has prescribed certain rates and regulations, including liability policy and accident insurance.

NEW CATALOGUES.

An instructive pamphlet has recently been published by the Kellogg Switchboard & Supply Company on the subject of repeating coils and phantom circuits, known as Bulletin No. 81. This new bulletin includes matters relating to phantom circuits, obtaining phantom circuit line conditions, transpositons, etc.

A large 18 by 32 in. wall hanger, printed in two colors, has been put out for the trade by The Cutler-Hammer Mfg. Company. of Milwaukee. It carries illustrations and complete data on the C-H line of push button sockets, switches and other wiring devices, thus making it a ready reference catalog and time saver.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, has recently prepared catalogue section DS930, which describes Electrostatic Ground Detectors and Voltmeters. These detectors are for use on both single-phase and poly-phase circuits. Electrostatic ground detectors are connected to the circuit through condensers, and are both sensitive and economical.

Small Motors, No. 23, issued by the Westinghouse Electric & Manufacturing Company, describes and illustrates the type CA single-phase motor and its starting mechanism. This motor is made in sizes from 1/20th to 3/4th h.p. Telephone Battery Charging by means of a mercury rectifier, has been described in Folder No. 4204-A. The construction of the rectifier is thoroughly described and illustrated, and the various component parts, and the functions of each, are clearly indicated.

The General Electric Company has just issued Bulletin No. 44712, which illustrates and describes G-E Lightning Arresters for Electric Railway Service, both in the station, on the line, and on the car. Bulletin No. 47,050 is devoted to Small Plant Switchboards made up of standard units in various combinations. These units are described and illustrated in detail, various combinations are illustrated, dimensions are given, and panels designated by catalogue numbers. The publication contains wiring diagrams and a list of accessories.

Edison Lamp Works of the General Electric Company has issued two new booklets which are particularly interesting. B-3337, entitled "The Illumination of Billboards by Edison Mazda Lamps," describes the Edison Mazda C Lamps with suitable reflectors used in connection with the illumination of billboards. This booklet also deals with the subject of building "flood lighting." B-3301-3 entitled "How our house is wired" has been particularly successful in old house wiring campaign work. This booklet points out the value of electric service in the home, and the proper arrangement of lighting fixtures, switches and wiring circuits.

NEWS NOTES

INCORPORATIONS.

LOS ANGELES, CAL.—The Coye Water Company has been incorporated here with a capital stock of $5000, by E. A. Holmes, T. S. Bell and W. B. Pinney.

ILLUMINATION.

TRACY, CAL.—John T. Beals has applied for a franchise for a gas plant and distributing system here.

MANHATTAN, CAL.—The board of trustees has passed a resolution ordering reinforced concrete lighting posts for Sixth and Seventh streets.

ROUNDUP, MONT.—This place is to have ornamental light. Approximately 100 posts will be installed, costing something like $100 each.

LIVERMORE, CAL.—The Pacific Gas & Electric Company has decided to extend its electric line to Sunol District, a distance of 4½ miles.

STOCKTON, CAL.—Residents of the town of Ripon have filed a petition with the supervisors, applying for permission to organize a highway lighting system.

MARTINEZ, CAL.—The board of supervisors has canvassed the vote cast at a recent municipal lighting election held at Crockett and has proceeded to form the district.

LOS ANGELES, CAL.—At a meeting of the board of supervisors a contract for furnishing electric current for machinery at the Monolith cement plant was approved and signed.

SAN FRANCISCO, CAL.—A contract has been awarded for light fixtures in the New City Hall Building to Leo J. Meyberg on his bid of $32,915, with alternate, making the total bid $32,999.

LOS ANGELES, CAL.—At a meeting of the board of supervisors an order was made calling an election for the formation of the Artesia Lighting District; election to be held on July 31.

LOS ANGELES, CAL.—The contract for furnishing current for a street lighting system in Hawthorne Lighting District has been awarded to the Southern California Edison Company by the board of supervisors.

LOS ANGELES, CAL.—At a meeting of the board of supervisors an order was made authorizing assignment of the franchise for maintenance of lights in Miramonte and Florence Lighting District upon the furnishing of bond.

AZUSA, CAL.—The board of trustees has adopted a resolution declaring its intention of constructing lighting posts in Centre street from Gerritos avenue to Orange avenue and Azusa avenue, from Tenth street to Fifth street.

LOS ANGELES, CAL.—"Greater Culver City" will have an electrolier lighting system that will harmonize with the present illuminating scheme of Culver City proper. Material for lighting equipment has already been shipped from the East.

SANTA BARBARA, CAL.—W. A. Brackenridge of the Santa Barbara Gas & Electric Company, says his company will stand the cost of installing conduits and ornamental lights along the west boulevard at an estimated cost of $4000.

LOS ANGELES, CAL.—No more clock permits or electric sign permits that have not been approved by the municipal art commission will be granted by the city council. This was decided in deference to the protest of the art commission against granting such a permit to the Security Savings Bank.

EVERETT, WASH.—An ordinance has been passed by the city council providing for submission to the voters at a special election on August 17th of the question of the construction of a plant for the generation of electric current by water power on the Sultan River.

RIVERSIDE, CAL.—Elmer Cutting of the electric light department estimates it will cost $12,000 to rebuild the old power plant of the Pacific Light & Power Company burned at Highgrove, and $7576.75 for a power line from present plant to the city substation.

SALEM, ORE.—State Engineer Lewis announces that the Wallowa Lake Amusement Company has made application for obtaining water from the Wallowa River to operate on overshot steel wheel for the development of 33 h.p. The proposed development is to be at Joseph, and will cost $500.

SANTA BARBARA, CAL.—The proposed ornamental lighting of the west boulevard from State street to the bath house, is practically a surety. It is planned that in all there will be about 23 ornamental lights placed on the west boulevard at a distance of about 120 feet apart. The entire cost of the lights, installation and all details would be about $4000.

SACRAMENTO, CAL.—The State Engineering Department has opened bids on the construction of the proposed power house at the Chico State Normal School. E. D. Sharp with $1420, was the lowest. Other bids were: C. B. Johnson, $1598; John A. Silva, $1643; Geo. W. Boxton & Son, $1772; Welch Bros. & Bannaman, $1989; and the Power Equipment Company, $2482.

SAUSALITO, CAL.—The board of trustees has passed a resolution of intention for the installation and construction of an electrolier system composed of 65 standards, together with necessary lamps, globes and other appurtenances on the following streets: Water from Richardson street to its intersection with Caledonia street and Johnson street; Caledonia street from its intersection with Johnson street to its intersection with Locust street.

PASADENA, CAL.—W. A. McNally Company was low bidder on the ornamental lighting system proposed to be installed on Pasadena avenue, Elevade drive and Terrace drive. Four bids were received as follows: W. A. McNally & Company, $9355; the F. O. Engstrum Company, $9480; Charles C. Glass, $9486, and the Southern California Electric Company, $9785. The bids were referred to Commissioner Allin of Department of Public Works for report.

LOS ANGELES, CAL.—The Railroad Commission has been informally requested to consider the gas rate controversy at Los Angeles as soon as possible after August 8th, when formal application will be filed. The gas company has appealed against the decision. The existing ordinance sets a rate of 64½ cents for a fifty-fifty mixture, and 57-cent rate for straight manufactured gas. Since the establishment of these rates an additional supply of natural gas has been brought in from the Sherman field, and is now being served by the Economic Gas Company. In addition, the Southern California Gas Company is rapidly constructing a line from Fullerton to the city, which will be completed not later than September 11th. These two additional sources will more than double the supply of natural gas available at the time of the fixing of the rates.

TELEPHONE AND TELEGRAPH.

GILROY, CAL.—The Gilroy Telephone Company has applied for a 25 year extension of its franchise here.

DAVENPORT, WASH.—The Union Valley Telephone Company has requested a franchise to erect lines in Lincoln county.

PENDLETON, ORE.—The Pacific Telephone & Telegraph Company will rebuild its plant in this city on the north side of the river at a cost of $5590.

NEW WESTMINSTER, B. C.—About 28 miles of pole line extensions will be erected throughout the lower Fraser valley this summer by the B. C. Telephone Company.

GOLD HILL, ORE.—According to announcement of Acting Assistant Forester Buck, 438 miles of telephone line will be constructed in the government forests of Washington and Oregon.

HAILEY, IDAHO.—The construction of a telephone line from Blaine to connect with the main line on Camas Prairie is under consideration by the Farmers of Blaine and Willow Creek.

LOS ANGELES, CAL.—At a meeting of the board of education a petition from the Home Telephone & Telegraph Company was read, asking that the Home phone be installed in elementary schools.

SOUTH BEND, WASH.—H. C. Kauffman of Centralia has purchased a controlling interest in the Willapa Harbor Telephone Company of this city and Raymond, and will probably extend the local lines to Centralia.

ANAHEIM, CAL.—At a meeting of the city council an ordinance was read giving specifications for conduits to be constructed for laying cables or wires for telephone lines and other power and electric lines in the streets of the city.

NORTH YAKIMA, WASH.—Application for permission to construct about 70 miles of new telephone line over roads in the southern part of the county has been made by the Yakima Valley Telephone Company. Hearing August 9th, at 2 p. m.

PORTLAND, ORE.—To meet the demands of its increased business, the Pacific Telephone & Telegraph Company announces that it will spend $19,000 in the near future improving its properties in the Sellwood, Taber and Woodlawn districts.

LOS ANGELES, CAL.—At a meeting of the board of supervisors an order was made authorizing the installation of conduit for telephone wires at the Museum of History, Science and Art, and directing the county purchasing agent to secure bids.

WALLA WALLA, WASH.—The Pacific Telephone & Telegraph Company announces that it will do away with the old battery system by installing a common battery instead at the telephone building. A new toll board will also be put in, the total cost of the improvement will reach $20,000.

SAN DIEGO, CAL.—The High School Board of San Diego High School District will receive sealed bids up to 1 p. m., July 29 for furnishing and delivery of 1 switchboard and 60 telephones and batteries to the San Diego High School building, according to specifications on file in the office of the board.

TRANSMISSION.

MINIDOKA, IDAHO.—The village of Albion, Idaho, has called an election for August 23rd to vote bonds for the installation of an electrical distributing system, which will supply electricity purchased from the United States Reclamation Service to the village, and also to the large State Normal School located at this point. The Reclamation Service will build the transmission line, nine miles long, and the substation at Albion. This town is ten miles from a railroad, and is reached over a mountain grade, making coal very expensive. For this reason electricity is much desired for cooking and heating, as well as for the ordinary uses. The State Normal School will equip its kitchen and laundry throughout with electric cooking and heating devices. Electric hot plates and other appliances will be used in the laboratories and in the domestic science department. Motors will be used for the shops and for supplying water under pressure for domestic purposes and for fire protection. Mr. G. A. Axline is president of the State Normal School, and Andrew Lounsbury is president of the village board of trustees.

WATERWORKS.

HARRINGTON, WASH.—The town of Harrington will vote on bonding the town to purchase a water system.

PRESCOTT, WASH.—The municipal water bonds have been sold to Morris Bros. of Portland. The bonds amount to $15,000.

LOS ANGELES, CAL.—At a meeting of the council the installation of a 12 inch water main in Santa Fe avenue was authorized.

LOS ANGELES, CAL.—Redondo Beach has voted down a bond proposal for $144,225 for the purchase of a municipal water system.

CATHLAMET, WASH.—The city council has appropriated $352.60 out of the city water fund for the installation of the settling tank for the water system.

PORTLAND, ORE.—It is expected that the issue of having the city take over the St. Johns water supply, which is privately owned, will be taken up soon. The owners hold the system at $150,000.

ROCKFORD, WASH.—The $1500 water bonds were sold to Ferris & Hardgrove of Spokane at par with accrued interest. Bids for the iron pipes were awarded to D. C. Farnsworth at $73.04 per 100 ft.

WHITTIER, CAL.—Following the report of F. C. Roberts, Los Angeles, consulting engineer, the water officials are working on improvements which will double the municipal water system capacity, at present 4,000,000 gallons per day.

LOS ANGELES, CAL.—A resolution has been adopted by the city council authorizing the installation of a 12 inch water main in Santa Fe avenue to serve the garbage reduction plant on Lenard street. The cost must not exceed $4000.

REDONDO, CAL.—An ordinance has been passed calling a special election to vote on the question of issuing bonds for $144,225 for acquisition of the water works of the Redondo Water Company.

DUNSMUIR, CAL.—The California-Oregon Power Company, which furnishes water to the town of Dunsmuir, has contracted for new water mains to be laid on Florence avenue, Dunsmuir, at a cost of $10,000.

SALEM, CAL.—State Engineer Lewis has forwarded to the state engineer of Idaho a certificate to the effect that an Oregon irrigation project for which water is sought to be appropriated from a stream in the Gem state is feasible. The Idaho legislature passed a law providing that water be appropriated from streams in that state for the irrigation of lands in Oregon if the Oregon engineer would certify to the project being feasible, and this is the first certificate to be issued under the law.

STOCKTON, CAL.—Officials of the Pacific Gas & Electric Company announce that they will extend water mains to new districts within the ensuing year. The company announces that a 20 inch well will be bored at Station No. 1 to supply additional water. Fire protection mains will be installed in a district bounded by Park, Weber, California and Pilgrim streets, at a cost of $4114.07. An 8 inch fire protection main will be extended on California street from Clay to Third, etc. The aggregate cost of the new work for which appropriations have been made is $31,090.57.